

STOKVIS

GX

Manual

- Installation
- Operation
- Maintenance

1. PLATE HEAT EXCHANGERS GENERAL DESCRIPTION

Between two plates of steel the heat transfer surfaces – the heat exchanger plates – are clamped with the aid of tightening bolts. The heat exchanger's construction enables a plate heat exchanger to be easily opened for inspection and cleaning.

Each heat exchanger plate is pressed in one piece, with no joints or welds whatsoever. Each plate has four holes punched out, one in each corner. Multi-pass heat exchangers have special turning plates in which two of the holes are left blank.

Rubber gaskets are glued in the gasket groove around the heat transfer surface and holes. The gaskets are supported on both sides by the corrugations in the plate.

The gaskets are double around the holes to prevent leakage between the media. In the event of gasket failure the medium runs straight out of the exchanger.

GX heat exchanger plates are made with two different arrowhead angles – one obtuse giving a high-theta plate, and one acute giving a low-theta plate.

Between two adjacent plates a flow channel is formed with the aid of the gaskets. The positioning of the gaskets produces a channel system through the entire plate pack in which the two heat exchanging media flow.

Liquid flows diagonally across the GX heat exchanger plates.

2. INSTALLATION

STOKVIS plate heat exchangers are pressure tested at the factory before delivery.

2.1 Erection

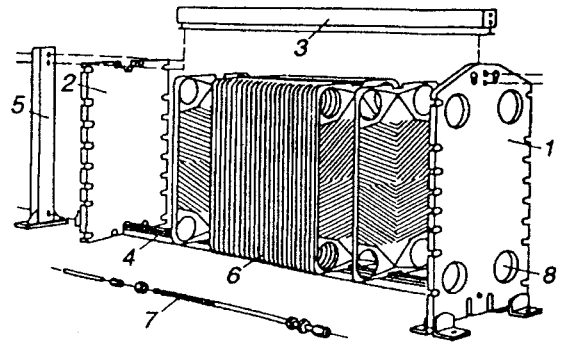
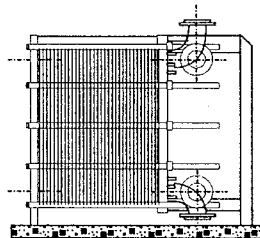
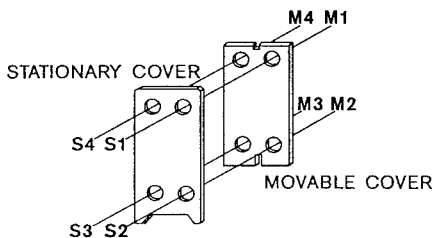
The heat exchanger must be installed with clearance on both sides:

Clearance	Size
300 mm	GX-6PI
600 mm	GX-12PI, 12P, 18PI, 18P, 26P, 42P
1000 mm	GX-51P, 37P, 64P, 85N, 85P
1200 mm	GX-91P, 118P, 60P, 100P, 140P, 180P, 145N, 205N, 205P
1500 mm	GX-265N, 265P, 325N, 325P

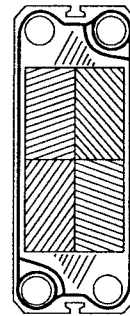
All connections to the heat exchanger must be provided with shut-off valves. The lower connections (S₂ and S₃; M₂ and M₃) must be provided with drain valves. The upper connections (S₁ and S₄; M₁ and M₄) must be provided with venting devices at their highest points.

The hot side's regulating valve should be installed in the feed pipe between the pump and the shot-off valve.

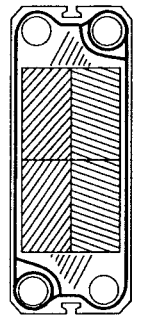
All connections to the movable cover must be made using removable 90 deg. elbows, allowing the movable cover to be pushed back for servicing.



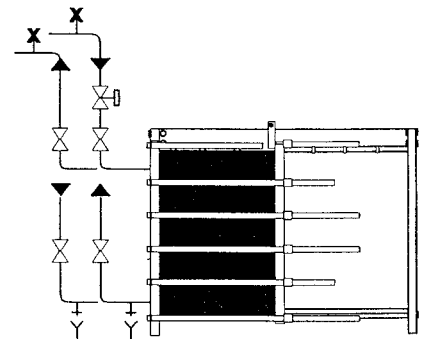
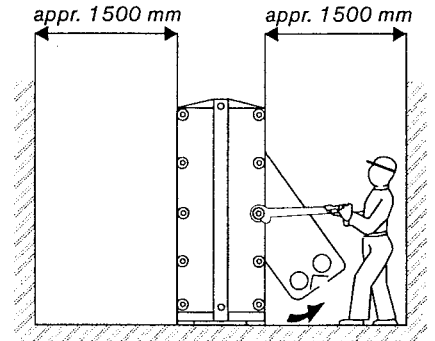
1. Fixed cover plate
2. Movable cover plate
3. Carrying bar
4. Guiding bar
5. End support
6. Plates
7. Tightening bolt
8. Connection port



High-theta plate



Low-theta plate



ALL NOZZLE LOADING MUST BE MINIMIZED DURING INSTALLATION AND OPERATION. THERMAL EXPANSION OF THE PIPING MUST NOT AFFECT THE PHE.

IN CASE OF WELDING, THE PHE MUST NOT BE USED AS A GROUNDING MECHANISM AS ELECTRIC ARCS MAY OCCUR BETWEEN THE HEAT TRANSFER PLATES.

3. OPERATION

- Check that the operating data does not exceed that given on the heat exchanger's nameplate.
- Check that all tightening bolts are properly tightened.

3.1 Pumps

Pumps feeding the heat exchanger must be provided with regulating valves. If the pumps can deliver a higher pressure than the rated pressure for the heat exchanger, safety valves must be installed. The pumps must not suck in air.

3.2 Start-up

To avoid pressure shock the pumps must be started against closed valves. The valves in the inlet and outlet should be opened at the same time as far as possible. The flow rate is then increased slowly until operating temperature is reached. Hammering must be avoided, otherwise the rubber gaskets may be displaced and cause leakage.

3.3 Venting

Immediately after start-up the exchanger must be vented. Remaining air can cause air locks and serious scorching of the plates, reducing the heat transfer capacity and increasing the risk of corrosion.

3.4 Shut-down

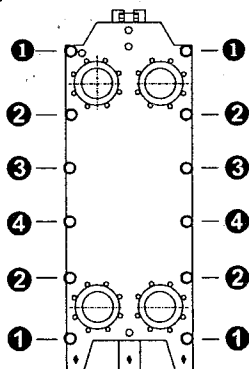
Shut-down should take place slowly.

For longer periods of down-time and especially when there is a risk of freezing or if the media are aggressive, the heat exchanger must be emptied and cleaned. While the unit is not in use, ease the tension on the tightening bolts so that the plates just lie against each other, but close enough to prevent any dirt entering between them.

4. MAINTENANCE

4.1.1 Opening the heat exchanger

- Cool the heat exchanger. If possible allow the heat exchanger to stand and cool overnight.
- Disconnect any connections to the movable cover plate.
- Remove bolts ①.
- Slacken nuts ②, ③ and ④ alternately, so that the movable cover plate can move parallel with the frame plate.
- Remove bolts ③ and ④.
- Slacken nuts ② alternately.



4.1.2 Taking out the plates

Use gloves – the plate edges are sharp!

If two or more plates have stuck together they must be separated carefully so that the gaskets are kept on the correct plate.

The plates support each other in pairs. If a plate has been so damaged that it must be taken out and cannot be repaired or replaced with an identical one, its adjacent plate must also be taken out of the exchanger.

If the number of plates are changed, so is the thickness of the clamped plate pack, A. (see 4.4.2).

Special plates, such as the first and last plates, and turning plates in multipass heat exchangers, **must** be replaced with identical plates.

4.1.3 Cleaning the plates

Fouling of the plate heat exchanger often depends on the flow velocity through the heat exchanger being too low. Where the possibility exists to increase the flow this should be tried out if the heat exchanger shows signs of reduced capacity or increased pressure drop.

However, with products that crystallize or heavily foul the plates or if the heat transfer surfaces have been scorched, opening and cleaning the heat exchanger is necessary.

- The heat exchanger is opened according to 4.1.1.
- Steel wool or brushes of carbon steel must not be used, nor may stainless steel be used on titanium plates.
- In the first place the heat transfer surface is cleaned by rinsing with a powerful jet of water and scrubbing with a nylon or similar brush.
- Take care not to damage the gaskets.
- Oxide or chalk deposits are removed with a soft brush and 2-5% nitric acid solution. (Hydrochloric or sulphuric acid may not be used). Organic deposits containing proteins are removed with a soft brush and 2% solution of sodium hydroxide solution at 50°C.
- Surfaces with greasy deposits are cleaned with kerosene and a soft brush. After cleaning, rinse thoroughly with water.

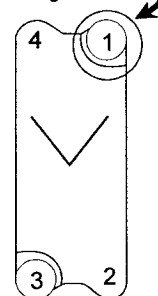
IMPORTANT: SODIUM HYDROXIDE AND CONCENTRATED NITRIC ACID CAN SERIOUSLY HARM THE SKIN AND MUCOUS MEMBRANES. THE SOLUTION MUST BE HANDLED WITH THE GREATEST CARE. ALWAYS WEAR PROTECTIVE GOGGLES AND PROTECT HANDS WITH RUBBER GLOVES.

4.2 Gaskets

GX heat exchange plates differ from conventional plates. Because the gasket groove lies in the plate's neutral plane, alternate plates have gaskets on both their sides, while the interleaving alternate plates have no gaskets at all. The gaskets used next to the cover plates are 1/2 thickness.

The double "ring" sections of the gasket are always placed at the top right and the bottom left of the plate.

Always to the right



4.2.1 Adjusting the gaskets

A gasket that has come loose, either partly or entirely, must be glued in place. If only a short length has become detached, glueing can be carried out immediately before clamping, with the plate still sitting in the frame. If the entire gasket has become detached, the plate should be taken out of the heat exchanger.

4.2.2 Suitable gasket glue

Only certain glues may be used for glueing gaskets, namely Bostik 1782, 3M EC 1099, Bond Spray 77 or Pliobond 20/30 Synthetic glue. Do not use other types of glue, they may contain chlorine or other substances which attack the plate material. To facilitate application with a brush, the glue should be diluted with acetone. Maximum dilution 1:1.

4.2.3 Cleaning the gasket groove

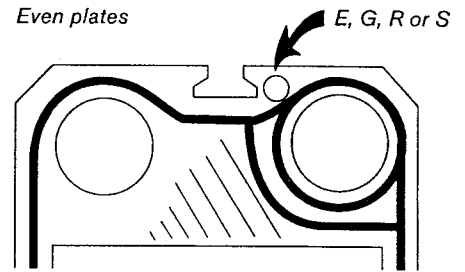
The solvent must not contain chlorine.

Clean the plates from residues of old gaskets. – Small patches of glue, hard to remove, that are securely stuck to the gasket groove may remain there. They provide an excellent foundation for the new gasket. Wash the gasket groove so that it is completely free of oil and other greasy substances, using a rag and acetone or other solvent not containing chlorine compounds. Then let the plate dry off.

4.2.4 Glueing the gaskets

The glue is applied with a small flat brush to those parts of the plate's gasket groove in which the gasket shall lie. These parts of the gasket groove are easily recognized as they differ in colour arising from previous residues of glue. The gasket is then placed into position on the plate. After drying for about 30 seconds (the time depends on the thickness of the glue film and how much the glue has been diluted), the glue holds the rubber gasket firmly in place in the gasket groove, thus facilitating mounting. The plate must then be held under light pressure with the aid of other plates or a stiff sheet of other material of suitable weight for about ½ hour.

When the glue joint has dried the gasket should be coated with talc to prevent the plates subsequently sticking to each other. The plates are then ready to assemble into the frame.

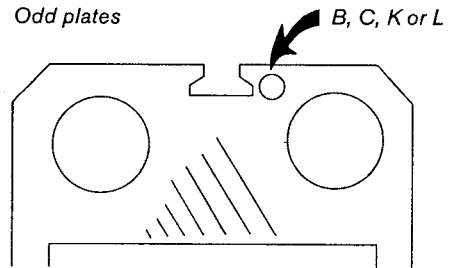


With gaskets both sides

4.3 PLATES

4.3.1 Marking

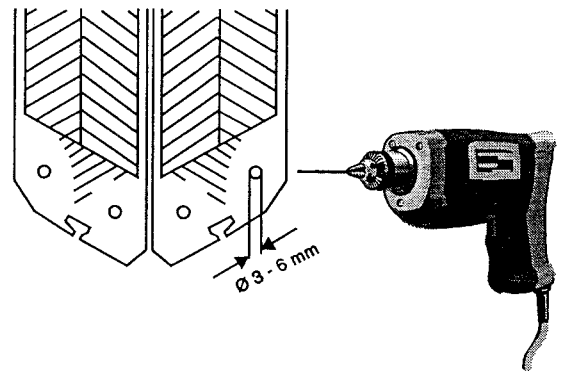
A GX plate is identified by means of an embossed code letter. This letter can be found to the RIGHT of the UPPER carrying bar cut-out, when the plate is facing TOWARDS the frame plate.



With no gasket

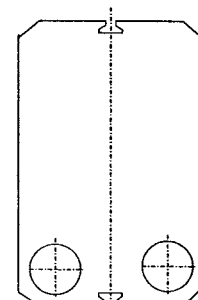
4.3.2 Special arrangement for draining multi-pass heat exchangers

The blank ports (2 and 3) in the turning plate for two-pass grouping and the first turning plate for three-pass grouping are provided with holes, 3 mm diameter for small units and 6 mm diameter for large units.



4.3.3 GX-37, 64, 91, 118 and GX-60, 100, 140, 180 and GX-85, 145, 205, 265, 325. Support plates for multi-pass grouping

To prevent deformation of the blank ports in multi-pass grouped heat exchangers, a support plate of stainless steel is placed after every turning plate.



4.4 Assembly

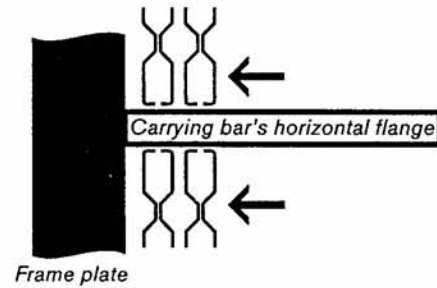
Before the heat exchanger is assembled, inspect all gaskets and surfaces that lie against the gaskets. Particles that may jeopardize the integrity of the seals or damage the gaskets or sealing surfaces must be removed. Note that contaminants usually collect at the lower part of the plates.

Plates that have been provided with new gaskets must be checked to make sure that the gaskets are in the correct gasket groove. Also check the ½ thickness gaskets on the first and last plates.

4.4.1 Inserting the plates

Every delivery is accompanied by a computer printout of the grouping scheme, giving each plate's code letter together with the plate's position in the heat exchanger.

When the plates are correctly positioned the flanged cut-outs at the upper carrying bar should point **towards** each other.



The plate edges form a regular honeycomb pattern.

4.4.2 Tightening the heat exchanger

The plate pack must be compressed to a specific thickness – the A-dimension. The A-dimension $\pm 3\%$ gives the inside length in millimeters between the fixed cover plate and the movable cover plate.

The A-dimension is: (Plate thickness 0.5 mm).

GX-6	$3.0 \times$ number of plates
GX-12/18	$3.4 \times$ number of plates
GX-26/42	$3.8 \times$ number of plates
GX-51	$3.8 \times$ number of plates
GX-37, 64, 91, 118	$3.4 \times$ number of plates
GX-60, 100, 140, 180	$3.8 \times$ number of plates
GX-85, 145, 205, 265, 325	$3.8 \times$ number of plates

Example:

A plate heat exchanger GX-12 has a total of 51 plates in the pack. The tightening length of the pack is:
 $51 \times 3.4 = 173.4 \pm 3\%$.

NOTE:

With large plate packs the A-dimension, due to tolerances in the plate thickness and depth of pressing, can deviate somewhat from that given above, $\pm 3\%$. With the **correct** A-dimension the plates lie in metallic contact with each other. Check this by examining the plate edges around the heat exchanger. Further compression can deform the plates.

The nuts must be tightened alternately. The movable cover plate must always be moved parallel to the frame at all times, and not drawn out of alignment.

- Tighten bolts ③ alternately.
- As the resistance increases also tighten bolts ① and ② - always alternately.
- Tighten bolts ④.
- Check the A-dimension along the heat exchanger.

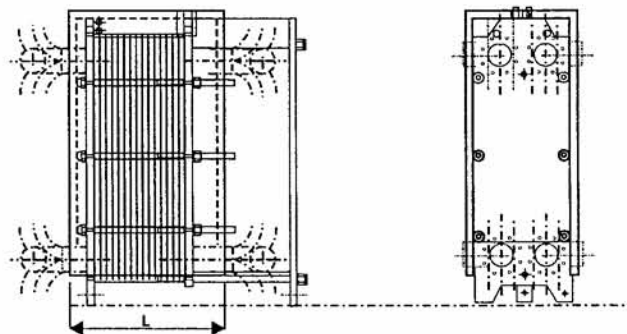
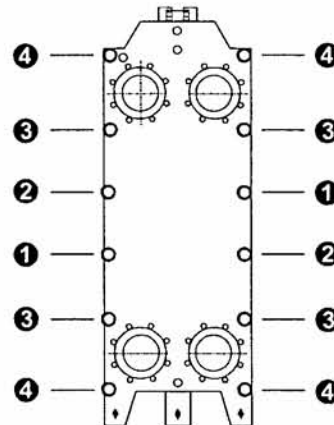
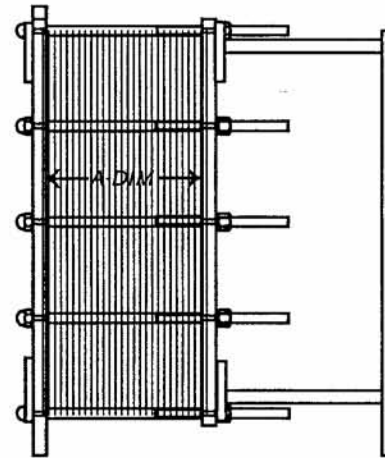
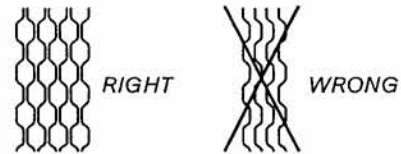
NOTE! NEVER TIGHTEN THE EXCHANGER WHILE IT IS UNDER PRESSURE!

4.4.3 Lubrication

The tightening bolts must be kept lubricated with molybdenum disulphide or its equivalent, particularly on the sections of thread used for opening and closing the equipment.

5. ORDERING SPARE PARTS

When ordering spare parts the heat exchanger type and production number must be quoted. These are given on the unit's name plate.



STOKVIS

STOKVIS ENERGY SYSTEMS
 96R WALTON ROAD, EAST MOLESEY
 SURREY, KT8 ODL.
 TEL: 08707 707 747, TEL: 08707 707 767